Notes on Breeding of Welcome Swallows in Captivity

By H. J. de S. DISNEY

Research Associate, the Australian Museum, Box A285
Sydney South, NSW 2000

INTRODUCTION

It appears that Taronga Zoo, Sydney, New South Wales, was the first, in 1979, to set up a breeding colony of swallows and martins, difficult birds to keep because of their aerial feeding habits and swift flight. The only other zoo known to me to be keeping swallows and martins is the Wuppertal Zoo (Germany), where Dr Ulrich Shurer keeps and breeds Barn Swallows (*Hirundo rustica*) and House Martins (*Delichon urbica*).

The first successful keeping of swallows seems to be that of a Mr Pearson over 200 years ago in 1785. He kept four of the European or Barn Swallows alive in England for three or four years and they only died when he became ill and was unable to look after them properly. They thrived and sang their chattering song all through the winter months and moulted after Christmas. A hundred years later, Teschemaker (1887), after reading of Pearson's success in Bewick (1797), successfully raised two Barn Swallow chicks from a nest in 1886. If they were tossed up in the air in the garden they would "circle round and over one in graceful curves, free as in the air, then shoot down in one moment and alight simultaneously on one's shoulder, twittering gaily the while and peer comically into one's hand to see if any dainty had been reserved for them". These two swallows were fed on lean meat and flies. Kennedy (1893) kept a Barn Swallow successfully, feeding it raw meat and boiled egg. Alexander (1893) raised a young House Martin on flies and kept it successfully on minced cold beef.

The Taronga Zoo colony was reported on by keeper Hamilton (1981). The colony was started by collecting half-grown nestlings in the wild. These were hand raised on a diet of egg-cake mixture (madeira cake), minced egg yolk, cheese and meat. Added to this was vitamin E, Pentavite, calcium phosphate and carophyll (colour food). Fly pupae (*Drosophila*) were put in the cake mixture and meal worms and moths were also given when available. The birds were acclimatized to flying in rooms before release into an aviary. Five Fairy Martins (*Cecropis ariel*)) and three Welcome Swallows of unknown sex were placed into an aviary approximately 7.5 m long, 3 m in height and 2.8 m wide. It had dead tree perches, a sheltered area of sandstone rock ledges, continuous running water, grass tussocks and reddish clay soil appropriate for nest building.

The aviary faced west and had other aviaries with mixed species on either side. Towards the middle of 1985 the aviary was renovated, the width doubled and the rock ledges replaced by cement-coverd wire mesh with small caves suitable for nest building. During renovation all old nests were destroyed. During the 1985/86 breeding season three new Fairy Martin bottle-shaped nests and three new Welcome Swallow nests were built. None of the Fairy Martins which hatched survived, but four young Welcome Swallows were successfully raised. This group has bred every year since 1979 and with other acquisitions at the end of the 1985/86 season numbered 22 Welcome Swallows and 8 Fairy Martins.

Stimulated by a letter from Dr Urlich Shurer in 1985 requesting information on the swallows, and at the suggestion of Mr Graeme Phipps (Curator of Birds), keepers Danny Olbrich and Nick Atchinson decided to collect as much information as possible and to observe and record the behaviour and breeding success of the swallows in the aviary. This note is based on their observations.

In April 1986 all the birds were caught and individually banded with a numbered aluminium band on one leg and a coloured band on the other.

Breeding Observations

Observations were usually made in the morning when the birds were fed, at about 9 a.m. If possible a quick check of the nests was made. This was repeated when the afternoon food was put in about 3 p.m. with short observations at other times, usually between 1 p.m. and 4 p.m. We were anxious to disturb the breeding birds as little as possible. It was not possible for observations to be made every day.

In courtship, only males were observed to sing. Edgar (1966) reported courtship feeding and high-level chasing flights and low-level flights with much tail fanning. These have not been recorded in the zoo aviary, but are similar to those described for the Barn Swallow by P. H. T. Hartley (in Tate 1966). Nick Atchison (pers.

comm.) has observed aerial "dog fights" in the aviary in the breeding season. These were probably between two males and were perhaps similar to the chases described by Tate (1981) and not courtship. Four pairs of swallows successfully laid eggs.

TABLE 1. Nest numbers used by pairs of Welcome Swallows in each clutch.

	Clutch			
Pair	1	2	3	4
A	2	2	2A	2
B	3	3	4	3
C	1	1		
D	5			

TABLE 2. Time in days to laying of next clutch.

	Clutch		
Pair	1-2	2-3	3-4
A	2	4	7
B	7	7	9
C	30		
D	—		

From Table 1 it can be seen that the birds generally used the same nest for first and second clutches, but pairs A and B built a new nest for the third clutch, returning to their original nest for their fourth clutch.

Table 2 gives the times in days from either loss or fledging of the previous clutch, to the start of the next clutch.

The replacement time from the third to the fourth clutches of the female of pair A, and the times for the clutches of the female from pair B agree with the shortest times reported by Marchant and Fullagar (1983), of seven to 30 days.

The interval of only two days between the first and second clutches of pair A is very short, and between the second and third clutch of only four days is again short. It is possible that the abundant food in the aviary allowed the female to re-lay so quickly.

Pair A

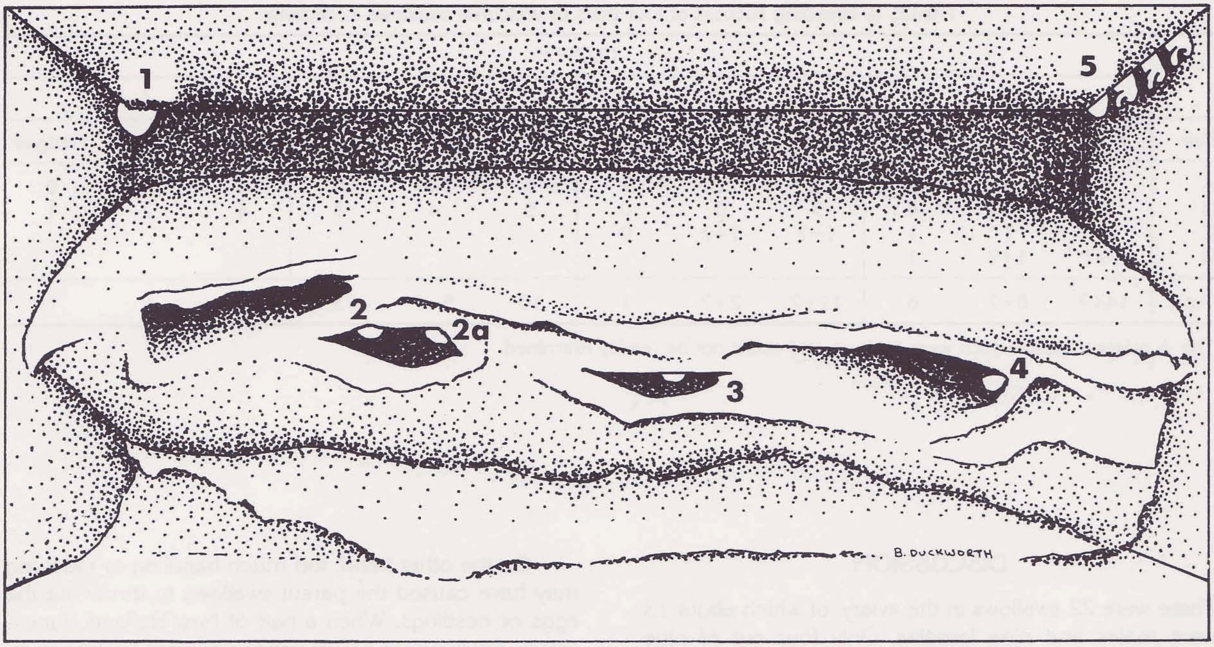
After their two hatchlings had been thrown out of the nest and found dead on September 9, this pair started building a new nest (No. 2A) on September 10. However, by September 12 the female had laid two eggs again in nest 2. On October 11 there was one hatchling about seven days old. This fledged by October 28 and the parents were again building nest 2A. The female carried dry grass and the male carried clay and grass. By October 29, nest 2A was completed and lined with down. The female laid the first egg of her third clutch on October 31, only four days after the fledging of the young one in nest 2. From a total clutch of five, only one hatchling survived for nine days and this, too, had died by November 28. By December 4 the pair had returned to nest 2 and the female laid the first of four eggs of her fourth and final clutch. All eggs hatched but no young fledged.

Pair B

Nest 3 was originally built in the previous season, 1985-86. On August 3 (the same date as Pair A) two eggs were in the nest. Four young hatched about August 20. On August 28 the adults were still adding nesting material, such as grasses and clay, to nest 3, while starting to build a new nest, nest 4. This was just a few dabs of clay on the rounded vertical surface of the cave. The adults were picking up clay from the stream edge. On August 29 they were still building nest 4 and starting to form the cup, while still feeding the young in nest 3. Nest 4 was nearly complete on August 31 and the male was seen to fly on top of the female for a brief moment. The male was seen to feed a fledgling on September 5, but all were feeding themselves at the feed tray by September 8. This date was probably the start of the second clutch as five eggs were found in nest 3 on September 12. On October 3, broken eggs were found on the ground and the nest was empty. By this date, nest 4 had been lined with down and on October 5 contained one egg. Five eggs completed this third clutch. Two hatchlings were found dead on the ground on October 28, one still partly in the egg and lying in water. Three young were raised and they fledged on November 13. The fourth clutch was completed with four eggs in the original nest 3 on November 25. Only one nestling survived and was flying by December 30.

Pair C

Nest 1 was originally built in the 1985-86 season. It was not easy to see into as it was up in a corner of the shelter and it was difficult to climb onto the shelf above the cave nests. On August 11 it was observed to be lined with down, but this pair were first seen at the nest on September 1, when the female was sitting. On September 5 there was much activity around the nest giving the impression that eggs might have hatched. When the male returned to the nest site, he apparently fed the female when she gaped at him. However, on October 3 the female was still sitting. One nestling was banded on October 23 and on October 29 three old eggs were removed from the nest. The female laid a second clutch and on December 15 one chick was seen peering over



CAVE SIZES (cm)

WIDTH	**90**	**30**	**35**	**115**
HEIGHT	**20**	**18**	**13**	**28**
DEPTH	**40**	**40**	**20**	**60**

Fig. 1. Welcome Swallow nesting area in aviary. Nests 1, 2 and 3 were originally built in 1985-86 season.

the rim of the nest. A dropping from a nestling was taken from one adult by another, who flew out over the soil and dropped it. On December 17 the chick was banded, but it died on December 24.

Pair D

The female was picking up clay and building a new nest (No. 5) behind the Fairy Martin nests on October 2 and 3. Like nest 1, it could not be readily examined. On October 29 there was at least one egg. A chick was first seen on December 12, when its head was seen above the rim of the nest. It was banded on December 15 and fledged on December 17.

TABLE 3. Incubation or apparent incubation times in days.

	Clutch			
Pair	1	2	3	4
A	31	(18)	16	15
B	17	—	(18)	18
C	32	(16)		
D	27			

Figures in brackets calculated.

From Table 3 it can be seen that seven of the clutches had an incubation time within the range of 14-18 days as reported by Clark (1981) when allowance is made for the age of the hatchlings when first observed. Three first clutches had apparent incubation times of almost twice the usual of 16 days: pair A about 31 days, pair C — 32 days, and pair D — 27 days. These are discussed later.

Table 4 shows that breeding success was poor. Of the 43 known eggs laid only 21 (48%) were known to hatch and only 11 (25%) fledged. This is about half as successful as in the wild (Clark 1981 (59%), Marchant and Fullagar 1983 (53%), Edgar 1966 (48%).

TABLE 4. Breeding success of four pairs of Welcome Swallows in captivity.

	CLUTCH											
	1			2			3			4		
Pair	Eggs	Hatched	Fledged	Eggs	Hatched	Fledged	Eggs	Hatched	Fledged	Eggs	Hatched	Fledged
A	5	2	0	5	1	1	5	1+?	0	4	4	0
B	4	4	4	5	0	0	5	4	3	4	2	1
C	4	1	1	1+?	1+?	0						
D	1+?	1+?	1									
Total	14+?	8+?	6	11+?	2+?	1	10	5+?	3	8	6	1

The + refers to nests which were high up and could not be readily examined.

DISCUSSION

There were 22 swallows in the aviary, of which about 13 were males and nine females. Only four out of nine possible pairs attempted to breed.

Part of the poor success may be inherent in swallow behaviour as Marchant and Fullagar (1983), in their examination of nest record cards, found many recordings of eggs disappearing during laying and incubation. This may have been due to squabbles among the swallows and the fact that some birds often start a clutch, do not complete it and then start in the same nest several days later. However, Marchant and Fullagar were uncertain whether these recorded irregularities were genuine or due to irregular or faulty observation.

In the Taronga aviary, two cases of possible interference by birds were seen. Once, when the male of Pair B chased another bird when it was seen to take an interest in the cave with nest 4, and again when other swallows were seen looking inside nest 2 of Pair A several times when the eggs were hatching and a hatchling was later found thrown out. It was put back, but four days later it was found dead outside in a tussock of grass together with another hatchling.

The swallows which did not have nests may have caused disturbances and even removed eggs and young or laid in the nests of the four breeding pairs. Such behaviour has been reported in other species. Marshall and Disney (1957) in Tanzania, East Africa, when experimentally breeding the colonial Red-billed Weaver Finch *Quelea quelea*, found that intruder birds would throw out eggs and kill nestlings. These birds without nests would go into a nest in which the nestlings were old enough to call and peck them on the head and kill them.

On the other hand, too much handling or touching may have caused the parent swallows to throw out the eggs or nestlings. When a pair of New Holland Honeyeaters, *Phylidonyris novae-hollandiae* were nesting in an aviary 150 cm × 150 cm × 150 cm Disney found that after he had touched the eggs, they disappeared. Five-day-old nestlings of this species died two days after being measured. At Taronga Zoo a quail egg was picked up and examined in the morning when the bird was incubating and by the afternoon the eggs had been scattered about the aviary and the bird had deserted the nest (R. Parrish, pers. comm.).

It would seem that in the close confines of a small aviary where the birds can watch you, it is probably unwise to touch eggs or nestlings. It is possible that birds can smell the human scent. Skutch (1976) quoting Lack and Lack (1952) says "in addition to removing cracked eggs from their nests, Common Swifts *Apus apus*, sometimes eject fertile eggs that hatch after a human has replaced them. That this action is deliberate rather than accidental is suggested by the fact that the birds may repeatedly and inexplicably throw from the nest a hatchable egg that has been returned to it. Sometimes the egg is carried out in the Swift's mouth."

The frantic building of new nests by both pairs A and B after their first clutches may have been partly caused by disturbances from other swallows, but more probably by the build-up of mites in the nest. The young of the first clutch of Pair B were heavily infested with mites when banded. The majority of Barn Swallows use a different nest for the second brood, probably due to the build-up of parasites, particularly mites, in the nest (Tate 1981).

The apparent long incubation period of the first clutches of pairs A, C and D is probably best explained by the female laying again when the first clutch did not hatch. Hence the eggs which finally hatched were probably from this second laying. Evidence of this happening in the field is given by Edgar (1966). He records that in one case the first clutch of three eggs was still warm 15 days after being laid with the parents nearby. At his next visit, there were eight eggs in the nest and the bird was sitting. Three chicks hatched and sometime around hatching date the three original eggs were cast out. At least one egg of the second laying was in the nest until the young fledged and it was then found on the ground. Some birds seem to know the condition of the eggs and remove them if they are abnormal or infertile. Skutch (1976) reported that one member of a pair of African White-rumped Swifts appeared at the doorway with an egg in its mouth, after much squeaking and rustling by both parents inside their closed nest. The bird threw it to the ground where it was examined by Moreau who found it to be without embryo after seven days' incubation. Perhaps an indication to the birds that the eggs are infertile is if, at the correct time, the chicks fail to break through the egg membrane and start to cheep and tap the egg with their egg tooth. In ducks this is two or three days before the eggs hatch (P. J. Fullagar, pers. comm.).

ACKNOWLEDGEMENTS

This work was done with Danny Olbrich. I wish to thank her for her enthusiasm, careful observations, collating her notes on the breeding pairs and for valuable comments on a draft of the text. Any inaccuracies are mine. My thanks to Graeme Phipps, Curator of Birds at Taronga Zoo for his support and permission for this study to be done.

Mr. Ron Parrish, Chief Keeper, kindly caught the birds for us to band and examine. The illustration of the nest sites was kindly done by Barbara Duckworth. Thanks also to C. N. Smithers and two referees for improving earlier drafts.

REFERENCES

ALEXANDER, W. C., 1893. A Tame House Martin. *The Field* No. 2095 Oct. 21, p. 607.

BEWICK, T., 1797. *A History of British Birds.* Newcastle **1:** 249-51.

CLARK, P., 1981. Results from a Nesting Study of Welcome Swallows in Southern Tasmania. *Corella* **5:** 85-90.

EDGAR, A. T., 1966. Welcome Swallows in New Zealand 1958-1965. *Notornis* **13:** 27-60.

HAMILTON, N., 1981. Breeding the Welcome Swallow and Fairy Martin in Captivity. *Thylacinus* **6**(3): 14-16.

KENNEDY, E., 1893. A Tame Swallow. *The Field* No. 2095, 18 February, p. 258.

MARCHANT, S. AND FULLAGAR, P. J., 1893. Nest Records of the Welcome Swallow. *Emu* **83:** 66-83.

MARSHALL, A. J. AND DISNEY, H. J. DE S., 1957. Experimental Induction of the Breeding Season in a Xerophilous Bird. *Nature* **180:** 647-49.

SKUTCH, A. F., 1976. (Second printing 1979). *Parent Birds and their Young.* University of Texas Press. Austin and London.

TATE, P., 1981. *Swallows.* Witherby, London.

TESCHEMAKER, W. E., 1887. Swallows and Swifts in Captivity. *The Zoologist* Pp. 372-75.

WILDLIFE FORUMS

Wednesday, 28 September

Speaker: Graeme Phipps
Subject: Breeding of Mallee Fowl

All Forums are held in the Society's rooms, at the end of the Education Centre at Taronga Zoo, at 8.00 p.m.

Entry is through carpark 3, off Whiting Beach Road.

Everyone is welcome — there is no charge.